

1 GUI

Figure 1 Widgets

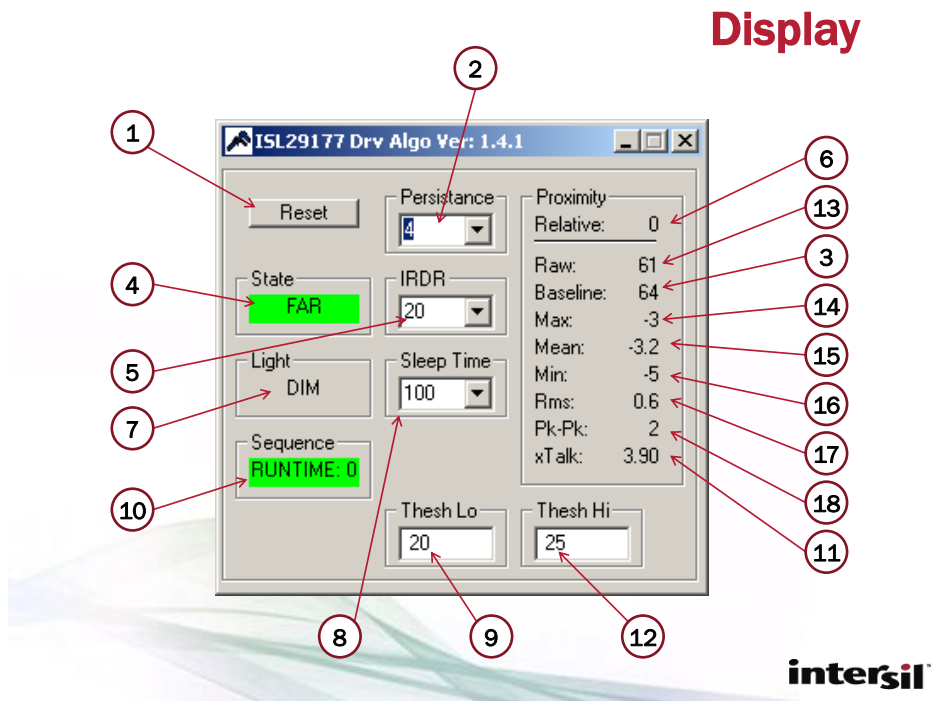


Figure 2 Widget Description

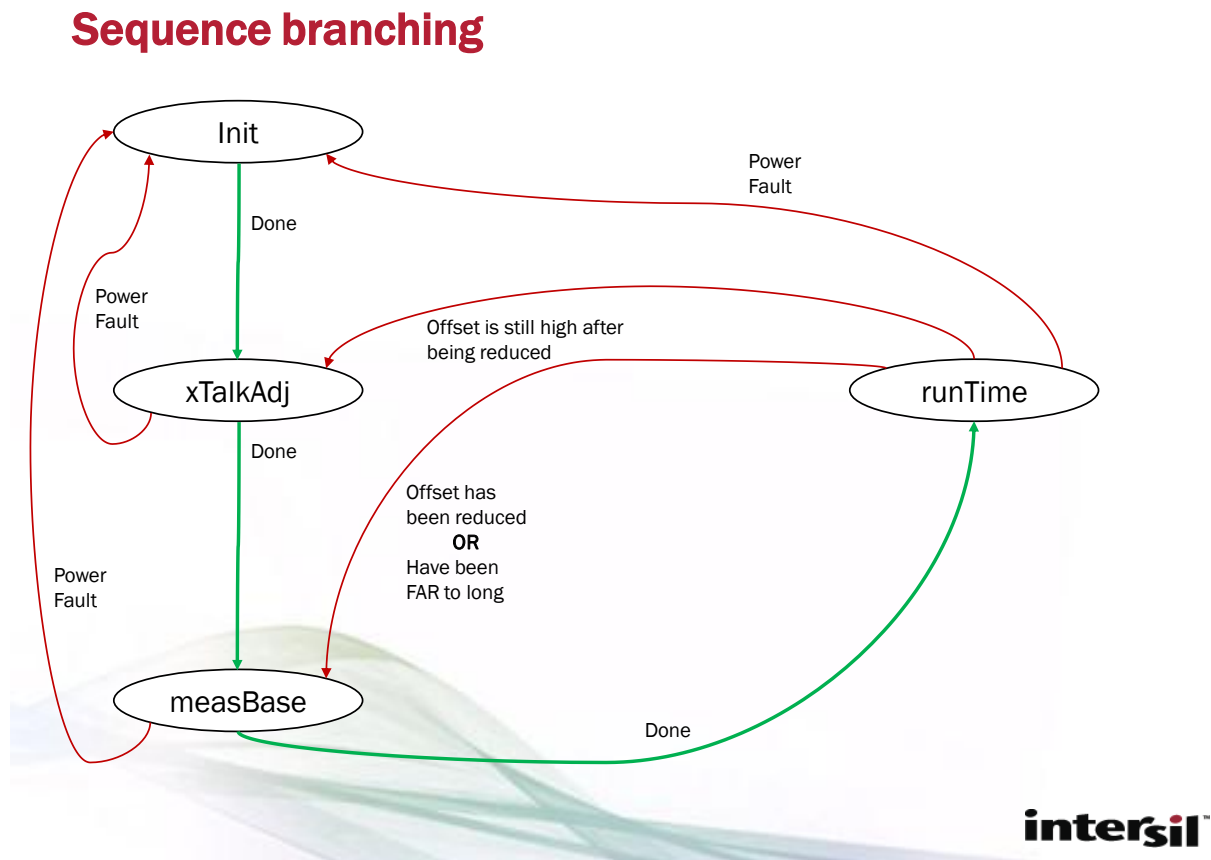
Display widgets

1. Reruns the startup sequences: INIT → xTalkAdj → MEASBASE → RUNTIME
2. Persistence Select = {1, 2, 4, 8}
3. ProxBase: Lowest value detected in LSBs, assumed to be FAR. Actual threshold settings are made relative to this #
4. State = {NEAR, FAR}
5. IRDR = {3.6, 7.1, 10.7, 12.5, 14.3, 15, 17.5, 20}
6. Relative Proximity: measured value in Raw(13) - ProxBase(3)
7. Light = {DIM, BRIGHT}
8. Sleep Time = {400, 200, 100, 50, 25, 25, 25}
9. Thresh Lo: Far level detection point
10. Sequence = {INIT, xTalkAdj, MEASBASE, RUNTIME}
11. Xtalk: crosstalk level in FSR
12. Thresh Hi: Near level detection point
13. Raw proximity data (0-255)
14. Maximum value detected in last 32 measurements
15. Average of the last 32 measurements
16. Minimum value of the last 32 measurements
17. RMS value of last 32 measurements
18. Maximum - Minimum value of last 32 measurements

2 Sequences

2.1 Sequence Branching

Figure 3 Sequence Branching



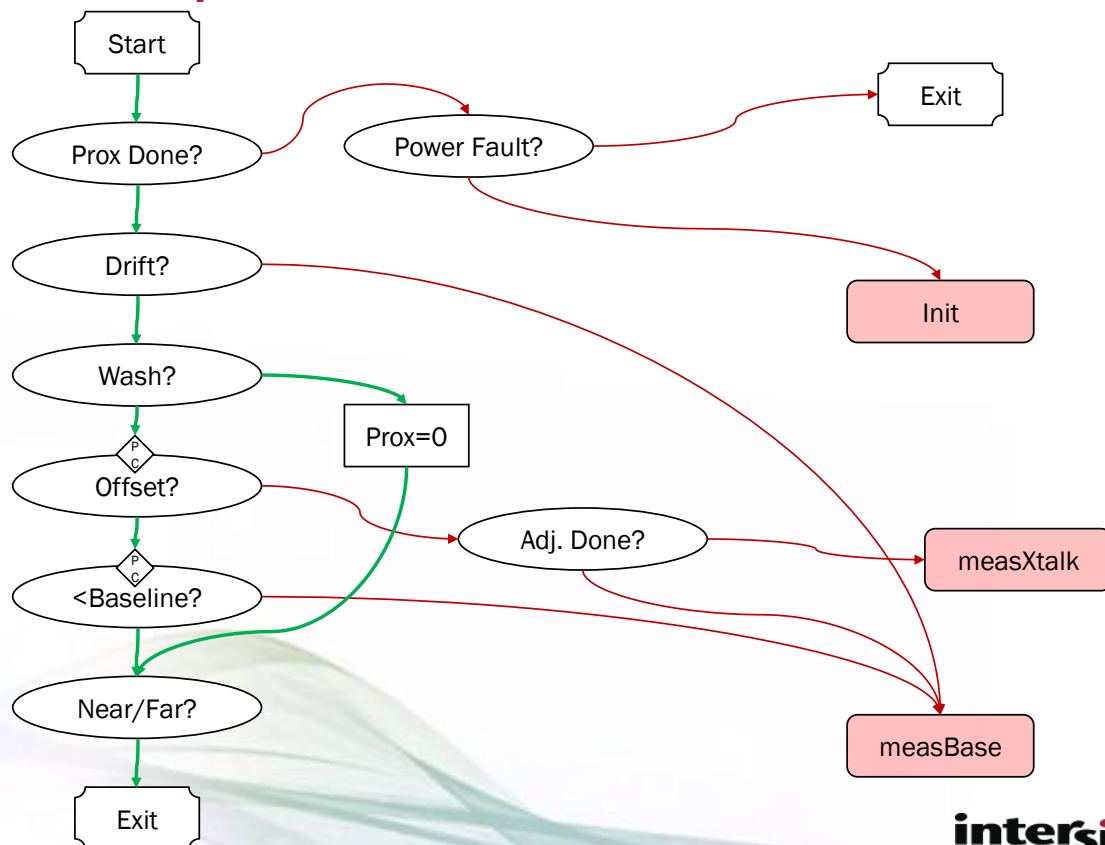
There are 4 sequences shown in Figure 3, Init, xTalkAdj, measBase and runTime. Each of these is driven by timers. Only one is active at a time (baton passing). Upon successful completion they branch to the next item until runTime is operational. This path is shown in **green** in the figure. Each of them may need to branch to a previous item if any fault conditions are detected. The branch back paths are shown in **red**.

The Init should only be run once on 1st startup. If a power fault is detected during operation it should be used to reset the device.

2.2 Sequence: runTime

Figure 4 Sequence: runTime

Runtime sequence



The runTime sequence is the most important and complicated of the group of sequences. A “flow chart” of this sequence is shown in Figure 4. This sequence, like the others is polled. Normal flow is from top to bottom on the left of the diagram, along the **green** paths. Branching to other sequences is along the **red** paths with the exit point also shown in **red**. The individual decision points are detailed below:

1. Prox Done? / Power Fault?

Purpose: Checks status register

Read *STATUS once* (it clears on read). Exit if the conversion is not complete. Reinitialize if the supply flag is set (power fault has occurred). Otherwise continue.

- a. **IF** [STATUS:PROX_DONE (0x6:B2) == 0] **EXIT**
- b. **ELSE**
 - i. **IF** [STATUS:SUPPLY_FLAG (0x6:B4) == 1] **Init** // power fault
 - ii. **ELSE** Drift?

2. Drift?

Purpose compensates for long term drift.

Once per user defined (default = 60 seconds) re-measure the baseline provided the proximity value is NEAR.

3. Wash?

Purpose: prevent self rise, if IR is detected for proximity value to 0, FAR

if PROX_WASH > minimum value detected +1 then proximity=0, go to Near/Far?

if minimum value detected > PROX_WASH then minimum value detected = PROX_WASH

4. Offset?

Purpose: Make sure minimum proximity detected > 0

After user defined (default = 3 cycles) persistence of proximity < 0

- a. Decrement LUT index by 1 (once), go to measBase
- b. If decrement done (4.a) then go to measXtalk

5. <Baseline?

Purpose: correct for incorrect Far level (baseline)

After user defined (default = 3 cycles) persistence of proximity < baseline go to measBase

6. Near/Far?

Purpose: return Near/Far result

If proximity < threshLo return FAR

If proximity > threshHi return NEAR

Else return last state

Example 1. VB6 Code

```
Private Sub tmrRunTime_Timer()
    Dim prox As Double, wash As Byte, offset As Long, pFlag As Boolean, np As Byte, pram As Long
    Static nearFar As Byte, lastProx As Double, lastBase As Double, lPflag As Boolean

    Static offsetReduce As Boolean      ' done already, remeasure xTalk
    Static offsetReductionCount As Long

    Static baseLinePersistCount As Long
    Static driftCounter As Long
    '
    ' This routine contains 3 possible state changes
    ' 1) Init: if "brown out" detected (initNeeded)
    ' 2) measBase: if prox = 0 for consecutive offsetPersist cycles (offsetReductionCount)
    ' 3) xTalkAdj: is offset has been adjusted already but is still 0

    Static primed As Boolean ' start on 2nd call

    If primed Then

        If als.GetProximity(prox) Then ' PROX_DONE

            prox = Int(prox * 255)

            ' =====
            ' occasionally remeasure the baseline to compensate for drift
            ' =====
            driftCounter = driftCounter + 1
            If driftCounter > 1000 * measBaseTime / (tmrRunTime.Interval) And prox < threshLo + baseline Then
                primed = False: gotoState state.stMeasBase
            End If

        Else

            ' =====
            ' check for power fault
            ' =====
            If als.getInitNeeded Then ' reset sequence (brown out)
                primed = False: gotoState state.stInit
            End If

            Exit Sub

        End If

        ' =====
        ' monitor the 2/3 pulse bit (for debug/testing only)
        als.readField BF.XPLS_, np
        lblSeq.caption = "RUNTIME:" & Str(np)
        ' =====

        pFlag = als.getPflag

        If pFlag <> lPflag Then
            lPflag = pFlag ' break here for flag change
        End If

        If pFlag Or 1 Then ' Poll/Interrupt And:Use Interrupt; Or:Poll

            dataValid = True ' XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                           ' unless offset too high REMOVE
                           ' XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

        End If

    End If
End Sub
```

```
' =====
' washout detection/ tracking
'als.GetProximity prox: prox = Int(prox * 255)
als.readField BF.WASH, wash
If washThresh > wash Then washThresh = wash ' new washout detect value
If wash > washThresh + 1 Then ' guardband threshold by 1 LSB
    prox = 0 ' bright light detected, force to zero
    nearFar = 0
    lblLight.caption = "BRIGHT"
' =====
Else
    lblLight.caption = "DIM"

    ' =====
    ' check if offset is too high, drop value by 1, remeasure baseline
    ' if has already been reduced once, readjust offset [PC]
    If prox = 0 Then
        offsetReductionCount = offsetReductionCount + 1
    Else
        offsetReductionCount = 0
        offsetReduce = False
    End If

    If offsetReductionCount >= offsetPersist Then

        If offsetReduce Then ' if drop by 1 didn't work, readjust offset
            primed = False: gotoState state.stXtalkAdj
        Else ' drop by offset by 1, remeasure baseline
            offsetReduce = True
            drv.dGetProxOffset pram 'returns LUT index in pram
            If pram > 0 Then pram = pram - 1
            drv.dSetProxOffset pram ' pram sets LUT index, returns offset in LSBs
            primed = False: gotoState state.stMeasBase
        End If
    End If

    ' =====
Else
    ' =====
    ' check for baseline level [PC]
    prox = prox - baseline
    If prox < 0 Then
        baseLinePersistCount = baseLinePersistCount + 1
        prox = 0
        If baseLinePersistCount >= baseLinePersist Then
            baseLinePersistCount = 0
            primed = False: gotoState state.stMeasBase ' remeasure baseline
        Else
            baseLinePersistCount = 0
        End If
    End If
End If
' =====
```

```
' =====  
' determine Near/Far  
If 0 Then ' Near/Far 0: use prox value; 1: use Prox Int Flag  
    nearFar = pFlag  
Else ' set to 1 for Motorola Logic  
  
    If prox > threshHi Then  
        nearFar = 1 ' Near  
    Else  
        If prox < threshLo Then  
            nearFar = 0 ' Far  
        Else  
            'in hysteresis band, use last value  
        End If  
    End If  
  
End If  
  
' =====  
  
End If  
  
End If ' wash/not  
  
updateProx prox, nearFar  
  
End If ' interrupt/poll loop  
  
Else  
    driftCounter = 0  
    primed = True  
End If  
  
End Sub
```

3 Test Procedure

3.1 Functional (Black Box)

3.1.1 Initialization

Start Driver with no object present:

Observe for > 1 minute:

1. State = FAR
2. $10 < \text{Baseline} < 100$
3. Proximity (relative) < 10
4. $10 \leq \text{Baseline} \leq 90$

ISL29177 Drv Algo Ver: 1.5.3

Reset

Persistence: 4

State: FAR

IRDR: 20

Light: DIM

Sleep Time: 100

Sequence: RUNTIME: 0

pFlag: 0 X

Adj. Time (ms): 406

Thesh Lo: 20

Thesh Hi: 25

Proximity:

- Relative: 1
- Raw: 91
- Baseline: 90
- Max: 1
- Mean: 0.3
- Min: -2
- Rms: 0.9
- Pk-Pk: 3
- xTalk: 4.00

3.1.2 Near/Far

1. Place flat object (i.e. paper) ~3cm from sensor
2. Verify NEAR state: Proximity (relative) > Threshold High (default=25)
3. $10 \leq \text{Baseline} \leq 90$

ISL29177 Drv Algo Ver: 1.5.3

Reset

Persistence: 4

State: NEAR

IRDR: 20

Light: DIM

Sleep Time: 100

Sequence: RUNTIME: 0

pFlag: 0 X

Adj. Time (ms): 547

Thesh Lo: 20

Thesh Hi: 25

Proximity:

- Relative: 59
- Raw: 70
- Baseline: 11
- Max: 60
- Mean: 57.1
- Min: 56
- Rms: 1.3
- Pk-Pk: 4
- xTalk: 3.99

4. Remove object
5. Verify FAR state: Proximity (relative) < 10
6. $10 \leq \text{Baseline} \leq 90$

ISL29177 Drv Algo Ver: 1.5.3

Reset

Persistence: 4

State: FAR

IRDR: 20

Light: DIM

Sleep Time: 100

Sequence: RUNTIME: 0

pFlag: 1 X

Adj. Time (ms): 593

Thesh Lo: 20

Thesh Hi: 25

Proximity:

- Relative: 0
- Raw: 12
- Baseline: 15
- Max: -2
- Mean: -2.1
- Min: -3
- Rms: 0.3
- Pk-Pk: 1
- xTalk: 4.01

3.1.3 False Offset recovery

1. Place flat object (i.e. paper) ~3cm from sensor
2. Reset driver
3. Verify FAR state: Proximity (relative) < 10
4. $10 \leq \text{Baseline} \leq 90$

ISL29177 Drv Algo Ver: 1.5.3

<input type="button" value="Reset"/>		Persistence: 4	Proximity Relative: 0
State: FAR	IRDR: 20	Raw: 25	Baseline: 26
Light: DIM	Sleep Time: 100	Max: 1	Mean: -0.6
Sequence: RUNTIME: 0	pFlag: 1 X	Min: -2	Rms: 0.7
Adj. Time (ms): 516	Thesh Lo: 20	Pk-Pk: 3	xTalk: 4.20
	Thesh Hi: 25		

5. Remove Object
6. Verify FAR state: Proximity (relative) < 10
7. $10 \leq \text{Baseline} \leq 90$

ISL29177 Drv Algo Ver: 1.5.3

<input type="button" value="Reset"/>		Persistence: 4	Proximity Relative: 0
State: FAR	IRDR: 20	Raw: 15	Baseline: 17
Light: DIM	Sleep Time: 100	Max: 0	Mean: -1.7
Sequence: RUNTIME: 0	pFlag: 1 X	Min: -4	Rms: 0.8
Adj. Time (ms): 500	Thesh Lo: 20	Pk-Pk: 4	xTalk: 4.02
	Thesh Hi: 25		

8. Return Object
9. Verify NEAR state: Proximity (relative) > Threshold
10. $10 \leq \text{Baseline} \leq 90$

ISL29177 Drv Algo Ver: 1.5.3

<input type="button" value="Reset"/>		Persistence: 4	Proximity Relative: 64
State: NEAR	IRDR: 20	Raw: 83	Baseline: 19
Light: DIM	Sleep Time: 100	Max: 65	Mean: 64.1
Sequence: RUNTIME: 0	pFlag: 1 X	Min: 63	Rms: 0.5
Adj. Time (ms): 485	Thesh Lo: 20	Pk-Pk: 2	xTalk: 4.02
	Thesh Hi: 25		